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EVALUATION TECHNIQUES FOR INTERPRETATION: Study Results From an Exhibition on Energy

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EVALUATION TECHNIQUES FOR INTERPRETATION: STUDY RESULTS FROM AN EXHIBITION ON ENERGY

Reference Abstract

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Six techniques for evaluating presentations were studied during an exhibition on man and energy at the Pacific Science Center, Seattle, Wash. A panel of outsiders, suggestion boxes, observed audience attention, and time-lapse photography all proved to be good techniques for evaluating effectiveness.

KEYWORDS: Recreation, information and education, interpretation, environmental education.

RESEARCH SUMMARY
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The Pacific Science Center's 1973 summer exhibition, "Energy and Its Relation to Man and the Environment," was studied to determine the effectiveness of evaluation techniques. The six techniques tested are rated in table 2.

When a presentation is being developed, problems are frequently obvious and the speed of evaluation is generally more important than its precision; otherwise, personal involvement may become so great that change is resisted. Evaluation before completion should be routine so problems can be corrected before investments in time, energy, and money become large.

With some understanding of the biases inherent in nonrepresentative samples of visitors, interpreters should be able to use inexpensively collected information to increase the effectiveness of presentations.

Contents

Introduction

In visitor centers and other settings for interpretation, evaluation of effectiveness has been widely recognized as important but seldom accomplished. Specific evaluation criteria and methods have not been readily available, and many staffs are too burdened with other duties to work out evaluation procedures. In addition, the high costs of many displays, exhibits, and other unmanned presentations often make experimentation impractical.

A unique opportunity for evaluation arose in 1973 when the staff of the Pacific Science Center created a "summer special" exhibition on energy and then modified it on the basis of evaluation by the Environmental Interpretation Research Project of the Pacific Northwest Forest and Range Experiment Station.

The Pacific Science Center and the Energy Special

Built as the Science Pavilion of the Seattle World's Fair, the Pacific Science Center comprises four buildings and is dedicated to helping the public understand science. In addition to its permanent exhibits on space technology, astronomy, mathematics, and the physical and life sciences, the center has for several years offered "summer specials." These add a dynamic element to the Center's normal attractions, creating topical additions that encourage visitors to return.

The theme for the 1973 summer special was "Energy and Its Relation to Man and the Environment." This "Energy Special" was set up in the Center's Allen Building with the floor space of approximately 80 by 104 feet (24 by 31 meters) divided into five parts. Four parts were used for the presentations listed in table 1. The fifth was used as a reading area.

Nearly all visitors to the Energy Special paid admissions of $1.50 per adult and $0.50 per child under 16. This undoubtedly affected audience composition.

Procedures

Evaluation began only after the Energy Special was complete enough to open--a month and a half after construction began. The first evaluation data were collected from an invited audience on June 28, 3 days ahead of the public opening. Evaluation data were collected until the exhibition closed on September 1, 1973.

In all, nine analyses were made. Six were evaluations: evaluation by a panel of outsiders, volunteered comments, observed audience attention, time-lapse photography, visitor voting at individual presentations, and following sample visitors. The other three examined hours of attendance, visitor characteristics, and interest in possible themes for future summer specials.

PANEL OF OUTSIDERS

During the summer, six "outsiders" were invited to visit the Energy Special and then to be interviewed concerning what they observed. None of the six was a specialist in interpretation, and none was associated with the Pacific Science Center. However, all were professional people with some experience or personal interest in interpreting scientific topics to the public.

VOLUNTEERED COMMENTS

A suggestion box was installed in the reading area with a note pad and pencil and a sign reading "We appreciate your comments. Please leave us a note." To avoid comments on other parts of the Pacific Science Center, the words "Limit comments to Energy Special" were later added.

Table 1--Description and availability of presentations at Pacific Science Center's 1973 summer special on energy and its relation to man and the environment

Trial exhibit area Five tables, usually with 1 or 2 employees available to operate exhibits and answer questions.	Formal exhibit area Minitheater for formal demonstration with informal seating for 20 people.	Informal exhibit area Puppet theater with seating on carpet and cushions, plus visitor-operated exhibits.	Laboratory area Enclosed classroom with tables, chairs, overhead projector, etc. Loudspeakers and windows permitted others to observe and listen.
Alternate energy sources--Pressing a button by energy source name lighted panel showing trade-off (e.g., generating X kilowatts kills Y fish). (August 27 to September 1) Energy storage--Visitors controlled flow from three plastic box "reservoirs" to simulate electric generation for imaginary city. (July 1 to September 1) Three dams--Similar to above. Visitors manipulated valves to make water wheel meet changing demand for electricity. (July 1 to July 28) Fuel hunt--Approximately 50 colored balloons in a box represented the major energy sources. The number of balloons of each color indicated the worldwide abundance of each source. Children were asked to find one balloon of each color. (August 10 to September 1) Energy supply puzzle--Each piece represented an energy source, with size of piece proportional to source's importance in energy production. (August 6 to September 1) Trade-offs--Horizontal clear plastic tube containing a ball and with variable speed fan at each end. Change in one factor (fan) upsets equilibrium (moves ball) unless balanced by other. (July 1 to September 1) Bicycle generator--Connected to 10 light bulbs. Adding bulbs to circuit increased effort needed by person pedaling to maintain brightness. (August 9 to September 1) Energy consumption adding machine--Adding machine and energy consumption chart permitted visitors to sum their annual energy use. (August 9 to September 1) Solar cooker--With photographs of its use. (July 17 to 23 and July 28 to September 1) Issues--Six light bulbs wired so that twisting one would light two, twisting another would dim others, etc. Text explained that side effects of any action are difficult to predict. (July 1 to September 1)	What's a watt?--Exhibit using bicycle and handcrank generators showed that a kilowatt is great compared with energy a person can produce. (July 1 to September 1) Chef Boy O Boy--The "chef" in this demonstration told people they "burn" food for energy. Much fossil energy is used for production, processing, and distribution of food. (July 1 to September 1) Gasoline shortage--Reasons were given in slide lecture, with shortage forecast and daily gasoline availability information on map of United States. (August 15 to September 1)	Kaleidoscope--Visitor stepping into triangular enclosure of mirrors saw his image reflected an infinite number of times. Sign asked, "Are there too many of you?" (July 1 to September 1) Walt Wasteful--10-minute puppet show on conserving energy in home. Postcards were given to children to mail in ideas on energy saving. Returned cards were displayed near theater. (July 25 to September 1) Hot Rod Harry--10-minute puppet show on origin, use, and pollution problems of petroleum. (July 1 to July 25) Pulleys--Three pulley arrangements showed that a large force over a short distance or a smaller force over a longer distance can represent identical amounts of energy. (July 1 to August 15) Energy waves--Water surface, soap bubbles, and vibrating cords were used to demonstrate transmission of energy by waves. (July 1 to July 28)	Candy ecology--Participants assumed roles of plants, grazers, and carnivores. Energy flow was simulated by flow of candy among participants. (July 10 to September 1) Card game--Object was to match "energy source" cards with "positive effect" cards while discarding "negative effect" cards. (July 15 to September 1) Growth patterns--Game with tiles on checkerboard showed that population growth varies with different constraints. (July 1 to July 25) Nuclear radiation--Participants used radioactive materials and Geiger counters to explore effectiveness of shielding. Discussion followed on protection of environment near nuclear powerplants. (July 1 to August 1)

Comments received during visitor voting (discussed under "Visitor Voting") were combined with comments from the suggestion box and grouped into those received between June 28 and July 16 and those received between July 19 and August 15.

OBSERVED AUDIENCE ATTENTION

Because presentations must hold attention if visitors are to enjoy and learn from them, audience attention was observed at the puppet theater and the laboratory area.[1/]

Two observers were located where they could unobtrusively observe the eyes of audience members. At 2-minute intervals, they scanned the audience and recorded the number of people watching the speaker or what he was presenting. Data were converted into percentages of people present and then graphed.

TIME-LAPSE PHOTOGRAPHY

To avoid some of the limitations of directly observing visitors, time-lapse movies were taken during a 4-day test. These used a super-8 movie camera with zoom lens and "single framing" capability. Colored film (ASA speed 160) was used without supplemental lighting. The camera was triggered by a cable release connected to a solenoid activated by microswitches and cams on an inexpensive electric clock motor. When gear ratios were altered exposures could be obtained at intervals of 4, 5.5, 8, 16, or 32 seconds. The entire assembly was mounted approximately 10 feet above the floor and 50 feet from the area photographed.

1/ Dick, Ronald E., Erik Myklestad, and J. Alan Wagar. 1975. Audience attention as a basis for evaluating interpretive presentations. USDA For. Serv. Res. Pap. PNW-198, 7 p., illus. Pac. Northwest For. and Range Exp. Stn., Portland, Oreg.

VISITOR VOTING

To permit visitors to vote directly on individual presentations, voting boxes and packets were provided from June 28 through July 17 and again from August 21 through August 31.

At each of six presentations, a box with five slotted compartments was provided, permitting visitors to vote from 1 (poor) to 5 (good) on each presentation. A colored photograph on each box showed the presentation to which it applied. As the Energy Special evolved, some boxes were shifted to sample newly completed presentations.

Each voting packet included a card with six voting slips attached--one for each presentation. A number on each card and its attached slips made it possible to determine how many votes each visitor cast.

At randomly selected times each day during the two sample periods, voting packets were given to as many visitors as possible--with two constraints. First, packets were given only to visitors judged to be 12 or older and capable of understanding instructions; second, no visitor received a packet without a complete explanation of its use.

Although each visitor received only one voting packet, three different packets were used, each with a different question. Each visitor was therefore asked only one of the questions: "How effectively was the information presented?" "How enjoyable did you find the subject matter?" and "How much new information did you gain?" To aid tabulation of answers, slips of a different color were used for each question.

Slips were collected daily and sorted by question (indicated by color of slip) and slot (1 to 5). The "average" vote was then computed (on a scale of 1 to 5) for each question at each presentation.

FOLLOWING SAMPLE VISITORS

Between July 24 and August 17, 171 randomly selected visitors were followed unobtrusively through the Energy Special. The observer carried recording forms and two stopwatches--one to record the visitor's total time in the building, the other to record his time at each exhibit or demonstration.

Because most presentations required at least some time for understanding, a "minimum learning time" was defined for each, based on the judgment of demonstration personnel and managers familiar with both visitor behavior and the intended message or objective of each presentation. Contact with a presentation was recorded only when a visitor stopped there for at least the minimum learning time.

As a basis for ranking frequencies of exposure, a contact factor was computed for each presentation as follows:

$$\text{Contact factor} = \frac{\text{number of contacts observed}}{\text{number of days presentation sampled}}.$$

HOURS OF ATTENDANCE

Soon after the Energy Special opened, it became obvious that the work schedules of demonstration personnel needed better coordination with peak hours of visitation. An attendance survey was therefore made by a volunteer working from 11 a.m. (when the Center opened) until 5 p.m. on 10 randomly selected days between July 20 and August 2. Although the center remained open until 8 p.m., few visitors arrived after 5 p.m. This permitted identification of peak periods.

Visitation data for the entire Pacific Science Center were routinely taken at the Center's ticket booth, so the survey also showed the percentage of visitors reaching the Energy Special.

VISITOR CHARACTERISTICS

To determine who visits the Pacific Science Center, a brief questionnaire was given to one member of each group entering the Center between August 3 and August 17. The 824 questionnaires distributed represented 2,615 visitors. All questionnaires were completed on the spot and dropped into a slotted box. Questions asked for a breakdown of each group by age classes and sex, the place of residence for each member in the group, and the number of times the person completing the questionnaire had visited the Pacific Science Center.

FUTURE "SPECIALS" QUESTIONNAIRE

To examine visitor interest in selected themes for future summer specials, a brief questionnaire was used for approximately a week in late August. This was provided in a rack attached to the visitor suggestion box in the reading area. Visitors could choose among four alternatives or write in their own. The four alternatives were: (1) man's five senses, (2) computers, (3) expansion of the Energy Special, and (4) man's effect on the environment.

Results and Discussion

A key finding of this study is the importance of feedback *early* in the development of a presentation before creative people have invested great amounts of time, energy, and ego. During the early stages of development, promptness of feedback and ease of obtaining it are probably more important than its precision.

The importance of timely feedback became obvious during the Energy Special. The staff of the Pacific Science Center actively sought and welcomed feedback as a basis for changing and improving the

presentations. However, evaluation did not begin until the exhibition was ready to open. This made any substantial changes quite painful for individuals who had labored under pressure for over a month to give physical form to their plans and ideas. Also, it took time to develop replacements for presentations to be discontinued. As a result, some ineffective presentations were retained longer than desirable.

The evaluation techniques tested are rated in table 2 and discussed below in terms of speed, burden on personnel, other costs, and usefulness.

Table 2--Rating of six techniques for evaluating interpretive presentations

Technique	Speed of feedback	Burden on personnel	Cost for equipment and materials	Guarantee against bias	Usefulness and limitations
Opinion from panel of selected outsiders	Excellent	Small	Low	Low	Identifies major problems before public presentation
Volunteered comments (via suggestion box)	Good	Small	Low	Low	Can identify range of reactions; respondents self-selected
Observed audience attention	Good	Moderate	Low	Good	Requires training. Assumes that "attention" indicates effectiveness. Respondent characteristics may differ at different presentations, making comparisons risky
Time-lapse photography	Good	Small	Moderate to high	Good	Records continually, identifies use patterns, and captures infrequent occurrences with little burden on personnel. Area covered from one camera position usually quite limited
Visitor voting at individual presentations	Fair	Moderate to great	Moderate	Moderate	Respondent characteristics may differ at different presentations, making comparisons risky
Following sample visitors	Good to fair	Great	Low	Good	Best for studying visitor orientation and movements. Inefficient for rating visitor interest in specific presentations

PANEL OF OUTSIDERS

One of the fastest ways to evaluate a presentation is to have several thoughtful outsiders examine it and comment on its strengths, it shortcomings, and opportunities for improvement. Such evaluation does not depend on public reaction and can therefore be used before a presentation is nearing its final form.

Because outside opinion is only as good as the insights of the outsiders used, careful thought should be given to their selection and preparation. Experienced interpreters and designers may bring preconceptions as well as special insights to the task. Thus, specialists whose views may closely parallel those of the people who created a presentation may give a less accurate estimate of public reaction than that provided by intelligent people who are not closely associated with interpretation and have no specialized knowledge of the subject matter being presented. To focus the attention of outsiders on pertinent matters, a checklist such as that suggested in figure 1 can be used.

VOLUNTEERED COMMENTS

Collection of volunteered comments can start as soon as a presentation is offered to the public. Such comments are easily obtained by providing a sign and suggestion box. They offer an evaluation opportunity too often neglected. Because suggestion boxes assure anonymity and prevent visitors from seeing other comments, they should yield better information than a visitor register with a "comments" column.

CHECKLIST

1. OBJECTIVES:
   a. From your observation of the interpretation, what do its objectives seem to be?
   b. Are they reasonable?
   c. (LATER) Are these the objectives outlined by the creators of the interpretation?
   d. If not, why the discrepancy?

2. AUDIENCE:
   a. In this setting, what are the likely objectives of the audience, and are the objectives of the interpretation compatible with the objectives of the audience or potential audience?
   b. What proportion of the potential audience is stopping?
   c. How long would it take the average visitor to fully experience this interpretation?
   d. How long are visitors actually spending with this interpretation?
   e. Do visitors seem interested or uninterested? Why?
   f. Which age groups seem interested and which uninterested?

3. SETTING AND DESIGN:
   a. Is it easy for visitors to reach or find this interpretation?
   b. Is the visitor given sufficient clues to experience different elements or units of the interpretation in a meaningful sequence?
   c. Is it easy and comfortable for the visitor to experience this interpretation? (Seating, if appropriate; suitable viewing available to children; etc.)

4. CONTENT AND DESIGN:
   a. Is any of the information incorrect? Unclear? Inappropriate?
   b. Do any conflicts occur within this interpretation or with nearby interpretation? (Consider competition for attention as well as conflicts in subject matter.)
   c. What opportunities for improvement are available?
   d. Why or how would these work better?

Figure 1.--Checklist for judging interpretive presentations.

Volunteered comments do not give unbiased estimates of average opinion and may overrepresent highly motivated or irritated visitors. However, because different visitors respond quite differently to any one presentation, interpreters must consider the *range* and distribution of opinion rather than average opinion.

Volunteered comments tend to focus on whatever strikes visitors as especially good or bad, thus detecting the extremes that define the range of opinion. If the conditions under which comments are collected do not change, volunteered comments can also identify trends.[2/]

[2/] If such conditions as the location of a comment box are changed, what appears to be a shift in visitor opinion might well result from the fact that comment boxes in different locations sample populations with somewhat different compositions. Likewise, if different kinds of visitors frequent a facility at different times of year, a change thought to result from improvements in the facility might in actuality result because an increased proportion of the visitors had strong interest in the things presented.

Table 3--*Summary of visitor comments on exhibits at the Pacific Science Center's summer special on energy, 1973*

Visitor comments	June 28 to July 16		July 19 to August 15	
	Number	Percent	Number	Percent
Complimentary	140	54.5	157	75.8
Suggested additions or improvements	38	14.8	18	8.7
Information poorly communicated	22	8.6	10	4.8
Boring	9	3.5	8	3.9
Expand and improve	10	3.9	7	3.4
Too elementary	9	3.5	5	2.4
Need more demonstrators	24	9.3	2	1.0
Demonstrators lack knowledge	5	1.9	0	0
Total	257	100.0	207	100.0

Table 3 summarizes visitor comments volunteered during two periods. Of the 464 comments received, well over half were complimentary, which, by itself, means little. A "congeniality bias" results from people's widespread tendency to be agreeable. The shift from 54.5-percent to 75.8-percent complimentary remarks is not readily explained by shifts in visitor composition or changed procedures for eliciting comments. This parallels other evidence of substantial improvement during the Energy Special.

Although compliments are nice, specific comments and suggestions are more likely to be genuine and provide a more useful basis for improvement. Some comments focused on lack of demonstration personnel, limitations in their knowledge, and level and effectiveness of communication. The same problems were identified by other evaluation techniques and were largely corrected part way through the summer, as reflected in the July 19 to August 15 columns of table 3.

OBSERVED AUDIENCE ATTENTION

Observation records can quickly identify changes in audience attention within a presentation (fig. 2) as well

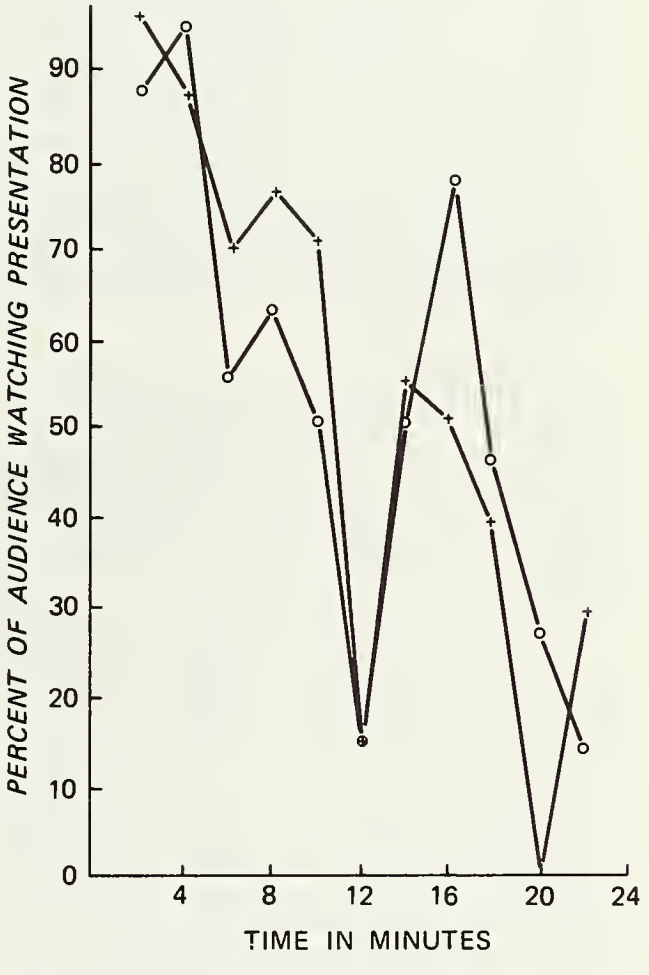

Figure 2.--Observed attention to the "candy ecology" laboratory presentation, Pacific Science Center, Seattle, Washington, 1973. Energy flows among plants, grazers, and carnivores were simulated by exchanges of candy among participating visitors.
+ = Observer 1. o = Observer 2.

as differences between presentations. Investing a little time in training observers pays off in more reliable results. As shown in figure 2, two trained observers consistently recorded similar patterns of attention.

Used with an observer's remarks, a tape recording of a presentation permits reasons for fluctuations in attention to be studied.

TIME-LAPSE PHOTOGRAPHY

Time-lapse photography quickly identified important patterns of visitor use during the Energy Special. For example, a time-lapse sequence showed the adding machine at the "family energy consumption" exhibit to be in almost constant use. It also showed that the demonstration personnel on duty in the trial exhibit area were often either absent or too busy to interact with all visitors. (Volunteered comments also identified the unavailability of demonstration personnel, table 3.)

For approximately $180 each, completely self-contained super-8 "surveillance cameras" are now commercially available. These time-lapse systems can be set up to record at intervals ranging from 1-1/4 to 90 seconds.

The 4-day test of time-lapse photography provided several insights for planning future time-lapse work. The preferred interval between exposures became 4 seconds. With intervals of 8 or more seconds, it was difficult to visualize the continuity of visitor movements while reviewing the film. At 4-second intervals, a 50-foot super-8 film magazine lasted 4 hours. The high-speed color film (ASA 160) did not require supplemental lighting; and "overnight" processing service was available for this film in Seattle. The lens was used at its shortest focal length (8 mm) during the entire test. A zoom lens was not necessary. Review of the film would have been facilitated with a projector equipped to run at two to four frames per second and to stop on selected frames. (Such projection equipment may cost from $300 to $700. But a good film editor is nearly as satisfactory.)

Time-lapse photography has four advantages: (1) It records continuously with little burden on personnel. (2) It creates a permanent record that can be studied and used in training. (3) By "compressing" time, it captures patterns of use that are otherwise difficult to visualize. (4) It makes a great amount of information readily accessible to top managers by condensing it to a few minutes of viewing.

VISITOR VOTING

The voting procedure identified general improvement in presentations during the summer but had several weaknesses. Although more than half the people who received voting packets voted at least once, only one person in seven voted on all six presentations. Visitors (as well as the panel of outsiders) found voting burdensome. Because tearing a slip from a card and dropping it in a multislotted box seemed simple, difficulties and discomfort with the voting system were quite unexpected. Problems may have resulted from a combination of (1) having to carry a voting packet, (2) being asked to concentrate on and respond to only one abstract dimension of a presentation, and (3) being expected to see the exhibition more thoroughly than planned. Visitors seemed generally unable or unwilling to partition their overall impressions in the abstract way requested by the questions. (Each visitor received a single "question card" designed to focus his evaluation on the enjoyability of the subject matter, how effectively it was presented, or the amount of new information gained.) If used, voting probably should be limited to total reactions to a single presentation.

An exhibit's location also seemed to influence its rating, with the highest ratings given to the last exhibits

encountered on the route usually taken by visitors. The most highly motivated (and therefore most enthusiastic) visitors probably saw and voted at more presentations than the average visitor. In contrast, the visitor only mildly interested in the whole exhibition was likely to leave after seeing and voting on the first one or two presentations encountered. Thus, much of the vote for some presentations may have come primarily from the more enthusiastic visitors. Bias from this source is inherent in the voting procedures and would be difficult to avoid.

As a final weakness, sorting and counting the voting slips required a great amount of time, preventing prompt feedback to those creating and modifying the exhibition.

FOLLOWING SAMPLE VISITORS

Although direct observation of visitor movements showed a great deal about the ways people move through a visitor center, it was not an efficient way to evaluate specific presentations. Approximately 72 man-hours were required (4 hours per day for 18 days) to collect data on 171 visitors making 206 contacts with the presentations offered. The relatively few encounters recorded for each presentation nevertheless showed a tremendous variation in the ability of different presentations to hold visitors for long enough to have meaningful effects (table 4).

On the average, unmanned presentations that were always available to visitors had higher contact factors than personal but unscheduled presentations. Demonstration personnel were not always available. Also, many visitors seemed to consciously avoid interacting with demonstrators.

Scheduled presentations had contact factors ranging from very good to very bad. The 5-minute Chef Boy O Boy presentation was scheduled

Table 4--*Pattern of visitor contacts with exhibits at the Pacific Science Center's summer special on energy, 1973*

Exhibit	Period available	Minimum learning time	Number of visitor contacts and days sampled	Visitor contact factor
		Minutes		
Kaleidoscope[1/]	7/1 to 9/1	0	42/18	2.33
Chef Boy O Boy[2/]	7/1 to 9/1	3	30/18	1.67
Solar cooker[1/]	7/17-23, 7/28 to 9/1	0	24/15	1.60
Reading area[1/]	7/1 to 9/1	0.5	26/18	1.44
Gasoline shortage (slides)[2/]	8/15 to 9/1	1	3/3	1.00
Walt Wasteful (puppets)[2/]	7/25 to 9/1	3	17/18	.94
Adding machine[1/]	8/9 to 9/1	2	6/7	.86
Candy Ecology Lab.[2/]	7/10 to 9/1	7	14/18	.78
Energy storage[3/]	7/1 to 9/1	0.5	13/18	.72
Issues[3/]	7/1 to 9/1	2	8/18	.44
Pulleys[1/]	7/1 to 8/15	1	8/18	.44
Puzzle[3/]	8/6 to 9/1	0.5	3/8	.38
What's a Watt[2/]	7/1 to 9/1	3	6/18	.33
Trade-offs[3/]	7/1 to 9/1	1	5/18	.28
Nuclear Radiation Lab.[2/]	7/1 to 8/1	3	1/18	.06
Fuel hunt (balloons)[3/]	8/10 to 9/1	2	0/6	.00
Card game[2/]	7/15 to 9/1	2	0/18	.00
		$\Sigma = 31.5$		

[1/] Independent of demonstrators and always available for visitor use.

[2/] Performed on a scheduled basis. Usually available the following number of times each day: Chef Boy O Boy, 3; Gasoline shortage, 1; Walt Wasteful, 4; Candy Ecology Lab., 4; What's a Watt, 2; Nuclear Radiation Lab., 2; Card game, 1.

[3/] Dependent on demonstrators; demonstrator assigned continuously.

to reach visitors during peak hours and required no active participation by audience members. Because the minitheater had no walls around the seating area, people could drift in or out unobtrusively. In contrast, presentations in the laboratory area tended to be longer (up to 30 minutes for the Candy Ecology presentation), required active audience participation, and were enclosed in a room that inhibited unobtrusive entry or exit. Also, the room had windows and speakers, permitting visitors outside the room to follow any activities taking place inside. In the predominantly "walk-through" setting, people seemed reluctant to commit themselves to anything they could not readily leave. Also, adults tend to be nervous about participating in anything that might make them look foolish to others.

Ratios between potential, possible, and actual amounts of contact are interesting. During the 18 days on which visitor movements were observed, an average of 15 presentations was available.[3/] Thus, the maximum number of contacts that could conceivably have been recorded was 2,565 (15 presentations X 171 visitors). However, the unavailability of demonstration personnel and the "short circuit" routes taken by many visitors reduced the total number of contacts actually possible to less than a fifth of this (503). Only 206 contacts were actually made by the 171 visitors observed.

On the average, the observed visitors stayed in the Energy Special area a short time. However, the average time increased from approximately 7 minutes during the first 18 days of observation to 17 minutes during the last 7, reflecting improvements in the exhibition. The 17-minute average stay compares favorably with the postulated minimum learning time of 31.5 minutes for all presentations, including those unavailable at any given moment.

VISITOR CHARACTERISTICS

Results from the survey of visitor characteristics showed that over half the visitors sampled were visiting the Pacific Science Center for the first time and lived outside the State of Washington. Over 60 percent were 25 or younger, and the most common group size was two persons. Although only the period August 3 to August 17 was sampled, results probably are close to what would have been found by sampling the entire July 1 to September period during which the Energy Special was available. Fewer out-of-State visitors and families with school-age children may visit the Pacific Science Center during June and late August.

HOURS OF ATTENDANCE

Approximately 55 percent of the people entering the Pacific Science Center eventually arrived at the Energy Special (fig. 3). To reach it, they normally

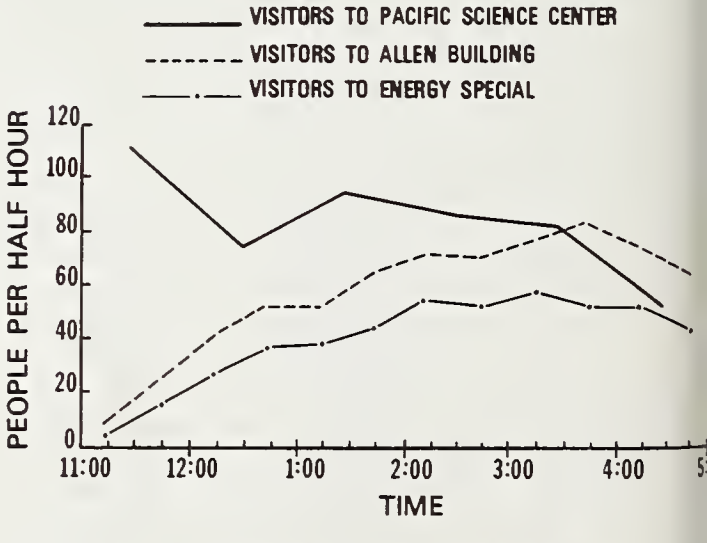

Figure 3.--Average attendance per half hou at Pacific Science Center, Allen Buildin and "Energy Special," July 20 to August 1973. (Although visitation to Pacific Science Center was recorded on an hourly basis, data have been adjusted to a half-hourly basis to make them comparable wit data for Allen Building and Energy Speci

3/ Actually, several more exhibits were available for a few days, but presentations available for less than 4 days were not included.

traversed three other exhibit halls with floor space equivalent to about two football fields! Traffic through the Energy Special therefore reached its higher levels approximately 45 minutes following the "after lunch" peak in admissions to the entire Center.

In addition to general fatigue, lack of a clear traffic pattern may explain why more Pacific Science Center visitors did not attend the Energy Special. At the main entrance to the Energy Special, the most prominent sign pointed to the Balcony Book and Gift Shop, and a one-way door prevented visitors from backtracking directly to the Energy Special once they had entered the gift shop. Also, visitors were provided few clues to an efficient route into and through the Energy Special. Clarification of this route and addition of one or two attention-getting exhibits near the most commonly used entrance to the Energy Special might have increased attendance.

FUTURE "SPECIALS" QUESTIONNAIRE

Of the questionnaires distributed on future "specials," 245 were returned. Among the four suggested topics, "computers" was the most popular with 98 responses (40 percent), followed by "man's effect on the environment" with 62 responses (25 percent), "man's five senses" with 43 responses (18 percent), and "expansion of the Energy Special" with 22 responses (9 percent). There were 20 write-in responses (8 percent) covering such diverse topics as electronic music, sex, undersea exploration, insanity and witchcraft, and the population explosion. Responses came only from people who chose to complete the short questionnaire, and highly motivated visitors may have been overrepresented.

When people's preferences were separated by age groups, a "mirror image" contrast emerged between "computers" and "man's effect on the environment" (fig. 4). This parallels other findings that, between childhood and maturity, people's interest tend to shift from the concrete and discrete toward the abstract and integrated and from concern with individual things toward processes and social concerns. Computers are sensational machines with awesome power, associated in many people's minds with physical images of spinning tape reels and flashing lights. In addition, computers are means rather than ends. In contrast, "man's effect on the environment" is much more abstract, involving social concerns and goals and the integration of diverse processes and factors.

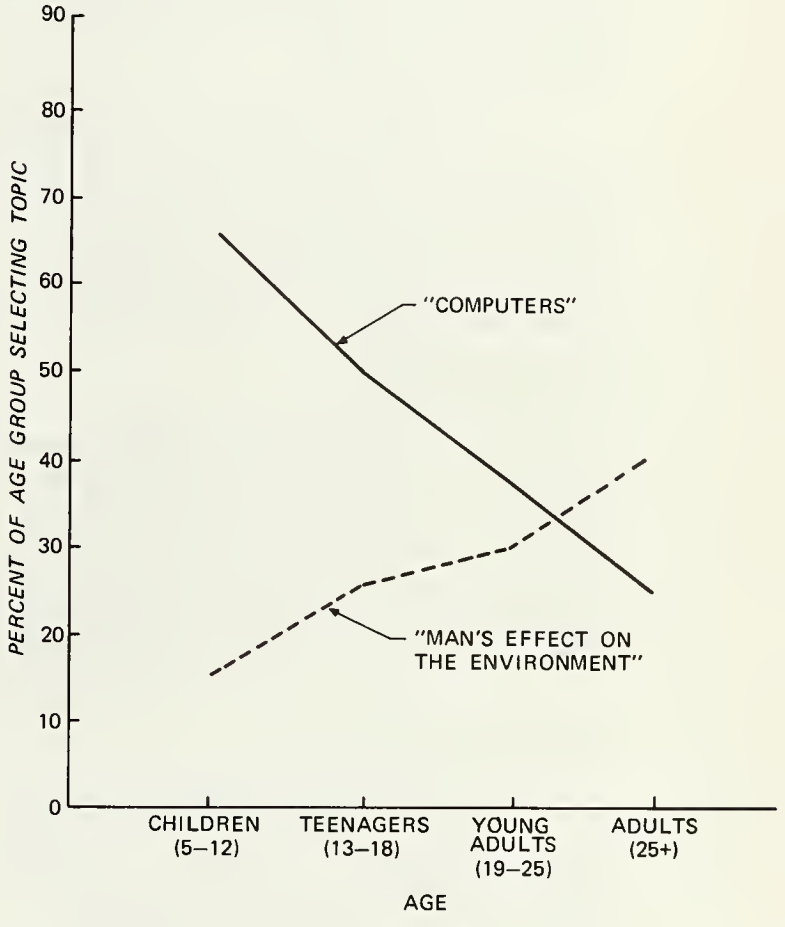

Figure 4.--Effect of age on preferred themes for future "summer specials" at the Pacific Science Center.

Although the data of figure 4 come only from "self-selected" visitors, they nevertheless warn that presentations aimed at one age group may largely miss another.

Conclusions

Two groups of conclusions result from evaluation of the Pacific Science Center's "summer special" exhibition, "Energy and Its Relation to Man and the Environment." One of these concerns evaluation techniques; the other, the "Energy Special" itself.

GUIDELINES FOR EVALUATION

From experience gained with six evaluation techniques, 12 guidelines for evaluation are offered:

1. When an interpretive presentation is being developed, the speed of evaluation is generally more important than its precision.

2. Comments from a few thoughtful outsiders can identify major problems at an early stage before large investments of time, money, and personal involvement make changes awkward. Pretesting could often avoid costly errors and should be routine for most presentations.

3. Documentation is important, becoming more than mere opinion to be countered by the opinion of anyone reluctant to change. Graphs, tables, and other summaries can separate widely shared reactions from those of isolated "cranks" and can uncover specific misunderstandings and problems.

4. Evaluation need not be complicated or expensive.

5. Once a presentation is open to the public, suggestion boxes will elicit many useful comments. Although such volunteered comments usually include many gratuitous compliments and define no "unbiased average," they do identify the range of visitor reactions as well as specific problems or opportunities for improvement.

6. When collected in a consistent manner, volunteered comments obtained at different times can identify trends in effectiveness.

7. Time-lapse photography and direct observation of audience attention can identify major difficulties in a presentation rather quickly and at reasonable costs in manpower and money.

8. Following randomly selected visitors can provide useful insights into the ways visitors perceive and find their way among the components of a presentation. However, the technique is time consuming and, in focusing on one visitor at a time, is not an efficient way to examine use levels or patterns at specific points within a building or exhibit room.

9. Because different people will respond to presentations quite differently, responses in some cases need to be classified by the age, sex, and perhaps other observable characteristics of visitors.

10. Direct comparisons of visitor response to different exhibits or presentations may be misleading. Because of inadequate orientation as well as differences in time and motivation, the kinds of visitors predominating at different presentations may differ markedly.

11. Visitors should not be expected to undertake complex or lengthy evaluation tasks. Because visiting interpretive presentations is usually a leisure time activity, carrying evaluation forms or reading even slightly complex instructions may be perceived as a substantial burden.

12. Requests that people respond to only one abstract dimension of a presentation are not likely to be understood.

THE ENERGY SPECIAL

Three different measures indicated improvement during the Energy Special. Favorable comments in the suggestion box, favorable "votes," and average length of stay all increased. Presentations probably would have improved in any case as a result of increased experience among personnel, informal feedback, and guidance from supervisors. However, formal evaluation accelerated improvement by diagnosing and documenting specific problems. These

included a mismatch between peak hours of visitation and the availability of demonstration personnel, the distraction a visitor-operated exhibit caused for a nearby presentation, and presentations that generated little visitor interest.

Evaluation identified three additional difficulties:

1. Having personnel available to answer questions and discuss exhibits was not very efficient, yielding few visitor contacts for the manpower expended. Similar results are likely whenever the flow of visitors is highly uneven--at times overtaxing the ability of personnel to interact with interested visitors, at other times leaving such personnel nearly idle.

2. Visitation to and enthusiasm at the Energy Special might have been substantially greater if it had been easier to reach. Of all visitors to the Pacific Science Center, 55 percent did reach the Energy Special, but usually after passing through three other buildings of exhibits.

In addition, eye-catching exhibits near the entrance to the Energy Special might have captured the interest of more visitors, a parallel to the "western" writer's recommendation, "Shoot the sheriff on page 1."

3. The enclosed "laboratory area" provided substantially fewer visitor contacts than the "minitheater," where visitors could drift in or out. Many visitors, especially adults, tend to avoid "classroom" settings where escape is difficult, participation is required, and ignorance may be exposed. However, people who did visit the laboratory area rated it quite highly.

Evaluation of interpretive presentations probably will continue to be more art than science. A great amount of somewhat imprecise information can be obtained at little cost in time and money and with little burden on visitors. With some understanding of the sources of bias and with overlapping data collection procedures as a check on any one method, managers of interpretive programs should be able to avoid the major pitfalls of using data from non-representative samples of their visitors. Many problems can be diagnosed from quite limited information. Nevertheless, managers must still weigh the risks of somewhat biased information against the costs of increased precision.

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Wagar, Alan J., Gregory W. Lovelady, and Harlan Falkin. 1976. Evaluation techniques for interpretation: Study results from an exhibition on energy. USDA For. Serv. Res. Pap. PNW-211, 13 p., illus. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Six techniques for evaluating presentations were studied during an exhibition on man and energy at the Pacific Science Center, Seattle, Wash. A panel of outsiders, suggestion boxes, observed audience attention, and time-lapse photography all proved to be good techniques for evaluating effectiveness.

KEYWORDS: Recreation, information and education, interpretation, environmental education.

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